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**NORTH KOREA: STATUS REPORT  
ON NUCLEAR PROGRAM,  
HUMANITARIAN ISSUES,  
AND ECONOMIC REFORMS**

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A STAFF TRIP REPORT  
TO THE  
COMMITTEE ON FOREIGN RELATIONS  
UNITED STATES SENATE

ONE HUNDRED EIGHTH CONGRESS  
SECOND SESSION

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## LETTER OF TRANSMITTAL

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*February 23, 2004.*

The Honorable RICHARD LUGAR,  
*United States Senator,  
Chairman, Committee on Foreign Relations.*

The Honorable Joseph R. Biden Jr.,  
*United States Senator,  
Ranking Member, Committee on Foreign Relations.*

Dear Senators Lugar and Biden:

In early January, we traveled to China, North Korea, South Korea, and Japan, to assess the prospects for a peaceful negotiated solution to the North Korean nuclear issue and to follow-up on three earlier visits to North Korea focused on gaining more transparency on food aid issues and encouraging greater North Korean adherence to international norms in the area of human rights. We met with foreign government officials as well as with professors and think tank specialists concerned with developments on the Korean Peninsula.

While in North Korea, we visited the Yongbyon nuclear facility along with Dr. John Lewis of Stanford University, Jack Pritchard of the Brookings Institution, and Sig Hecker, former Director of Los Alamos Nuclear Laboratories. We also requested of North Korean officials and were granted meetings to afford us an opportunity to engage in detailed discussions on a number of humanitarian issues, including food aid, prison conditions, and the Japanese abduction cases. We also traveled to Seoul and Tokyo to meet with key officials. We wish to acknowledge the efforts of officials at the State Department in Washington and abroad who helped to facilitate our travels.

A report on our major activities and key findings, including some thoughts about the next steps on the Korean Peninsula, follows below.

Sincerely,

KEITH LUSE,  
*Professional Staff Member, Majority Staff,  
East Asian and Pacific Affairs.*

FRANK JANNUZI,  
*Professional Staff Member, Minority Staff,  
East Asian and Pacific Affairs.*



## EXECUTIVE SUMMARY

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Senate Foreign Relations Committee (SFRC) staff members Keith Luse and Frank Jannuzi traveled to China, North Korea, South Korea, and Japan January 3–15 to assess the prospects for a peaceful negotiated solution to the North Korean nuclear issue and to follow-up on earlier visits to North Korea designed to encourage greater North Korean transparency on food aid and greater adherence to international norms of behavior on a broad array of human rights issues.

While in North Korea, our delegation interacted with a group of three private citizens—Dr. John Lewis of Stanford University, Jack Pritchard of the Brookings Institution, and Sig Hecker, former Director of Los Alamos Nuclear Laboratories—and accompanied them to the Yongbyon nuclear facility. This marked the first time North Korea has allowed foreigners to enter its key nuclear facilities since it expelled IAEA monitors in December, 2002. We have relied on the observations of Dr. Hecker to convey key findings from Yongbyon. Dr. Hecker’s testimony to the Senate Foreign Relations Committee is attached to this report. (*See* page 13.)

Over the course of five days in the North, we held a variety of meetings with DPRK officials to discuss their nuclear program and to encourage greater North Korean respect for human rights. The delegation sought to clarify North Korea’s December 9 offer to “freeze” its nuclear program, and urged North Korean officials to abandon their pursuit of nuclear weapons and seek a peaceful, negotiated solution to the crisis through multilateral dialogue.

While at Yongbyon, Dr. Hecker was able to confirm that the 5 MWe nuclear reactor is running normally and that the 8,000 spent fuel rods which had been stored under International Atomic Energy Agency supervision under the terms of the 1994 Agreed Framework have been removed from their canisters and are no longer in the spent fuel storage facility. Our tour of the Radiochemical laboratory also convinced Dr. Hecker that North Korea has the capability to reprocess spent fuel and produce plutonium metal. North Korea did not make available any DPRK personnel who may have expertise in nuclear weapons design and manufacture, and Dr. Hecker reached no conclusions about the North’s ability to build a nuclear device.

During a discussion with Foreign Ministry officials on the North’s nuclear program following our time at Yongbyon, Vice Foreign Minister Kim Gye-gwan claimed that unlike Iran and Libya, North Korea actually has weapons of mass destruction. Kim said that North Korea had provided us with evidence of their “nuclear deterrent.” These were the most explicit statements we received that North Korea has produced nuclear weapons.

As for U.S. allegations that North Korea has a clandestine program to produce highly enriched uranium (HEU), Kim Gye-gwan and other DPRK officials stated categorically that the DPRK has no program for enriching uranium.

On the human rights front, Luse and Jannuzi had the opportunity to engage in detailed discussions on a number of issues, including food aid, prison conditions, and the abduction of Japanese nationals by North Korean intelligence agents. We emphasized that the United States' concern for the human rights situation in North Korea reflects the deeply held convictions of the American people. SFRC staff encouraged DPRK officials to permit greater transparency for food aid deliveries under the auspices of the World Food Program and various non-governmental organizations, and we discussed ways in which North Korea might reduce its dependence on foreign food aid by adopting new methods of food production and moving toward market-based distribution mechanisms. The delegation pressed DPRK officials to allow outside access to its prison facilities to assess food needs and humanitarian issues there. We also met with Foreign Ministry officials to express our hope that North Korea would take steps to fully resolve the issue of the past abduction by the DPRK of more than a dozen Japanese nationals. We explained that the prompt resolution of this issue was a matter of international concern and of particular interest to members of the Congress. The delegation requested information on the abductees and their family members still in North Korea and passed this information on to the Japanese government.

Finally, the delegation had a chance to review the progress of North Korea's economic reforms launched in July of 2002. We found considerable evidence that North Korea is committed to moving toward a market economy, but it is too soon to draw conclusions about the ultimate success or failure of these initiatives. North Korea suffers from critical resource shortages and it may not yet fully grasp the institutional changes that will be necessary if its fledgling economic reforms are to yield a significant boost in DPRK production and an improvement in living standards for the North Korean people. Even if North Korea's economy begins to grow, it is not clear how this will affect the nation's social and political stability. Officials with whom we met recognized that the North's ability to expand trade and attract foreign investment and receive loans from international financial institutions depends in large measure on the peaceful resolution of the nuclear issue.

## **NORTH KOREA: STATUS REPORT ON NUCLEAR PROGRAM, HUMANITARIAN ISSUES, AND ECONOMIC REFORMS**

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### **NORTH KOREA'S NUCLEAR PROGRAM**

Prior to our visit to Yongbyon, Vice Foreign Minister Kim Gye-gwan told us that North Korea had decided to permit our visit to break through the "stalemate" at the six party talks and to provide "more transparency on our nuclear program that has been shrouded in mystery." Kim also said North Korea hoped to differentiate its nuclear program from those pursued by Libya and Iran. "They claim they do not have weapons of mass destruction. We claim that we do have weapons of mass destruction, and we leave the conclusions to your side."

Kim said that North Korea had chosen to reprocess the 8,000 spent fuel rods from its nuclear reactor to "strengthen our deterrence" in response to the "intensifying hostile policy" of the U.S. Government. He specifically cited the President's reference to North Korea as a member of the "Axis of Evil," as well as the inclusion of North Korea in a list of countries subject to "pre-emptive strike" by the United States. Kim told the delegation that he believes only the North's nuclear deterrent has prevented the United States from launching a pre-emptive attack. "Once we lay down our gun, the United States would attack immediately."

Nonetheless, Kim repeatedly stated that North Korea remains interested in the "final goal" of a nuclear free Korean Peninsula, and said, "If we are to reach the final goal, we need to become serious about specific action steps, not just talk. A freeze of current activities might be a first step. At Yongbyon, you will see the importance of a freeze. We are prepared to give up our nuclear activities, have no transfer to other nations, and no testing of any kind. We truly believe this is the right place to start." Kim later clarified that the North's freeze proposal "only makes sense as a starting point to reach the objective of a non-nuclear peninsula. We don't want to stop at a freeze." He also emphasized that "how to freeze" and "what comes next" are issues the North hopes can be discussed in detail at the next round of six party talks, and that North Korea is "... fully open to these kind of talks."

Our delegation raised the question of the North's alleged program to develop highly enriched uranium (HEU). Kim Gye-gwan stated categorically that the DPRK "has nothing to do with any HEU program." Kim said, "We have no program, no facilities you are talking about, or scientists trained for this purpose [enriching uranium]."

Kim Gye-gwan continued, “Our policy on nukes is based on natural uranium, not highly enriched uranium . . . We don’t have any plans for HEU or facilities for that purpose.” Moreover, Kim flatly denied that North Korea had ever admitted to having an HEU program during the October, 2002 meeting with Assistant Secretary of State James Kelly in Pyongyang.

#### *Yongbyon Visit*

On Thursday, January 8, we spent roughly six hours at the Yongbyon nuclear facility. Yongbyon is about two hours by car from Pyongyang, with much of the last hour spent on unpaved roads. The Yongbyon nuclear complex is a city unto itself. DPRK officials said that about 1,000 scientists and technicians work and reside at the facility, and several thousand others provide support services, grow food, etc. During our visit, we were at all times escorted by senior officials at Yongbyon as well as by Ambassador Li Gun, our Foreign Ministry host.

Of the five Americans who visited Yongbyon, only Dr. Hecker possesses detailed understanding of the workings of a nuclear power plant and the science connected with the extraction of plutonium from spent reactor fuel and the production of plutonium metal. Dr. Hecker’s expertise allowed him to ask probing questions and to engage in expert level discussions with his counterparts. Accordingly, we have not tried to make any independent assessments of the North’s nuclear capabilities. We are relying on Dr. Hecker’s findings, and will make only a few general observations about the tenor of our visit.

North Korean officials at Yongbyon exhibited an easy confidence during our tour, answering questions promptly and with thoroughness. They seemed eager to showcase their facilities and what they had accomplished. Yongbyon facility director Ri Hong-sop told us that North Korea’s nuclear program was developed indigenously. In response to a question, Ri denied that North Korea had provided any nuclear technology to Burma or any other country.

The DPRK scientists confined their remarks and exchanges to the science of running a nuclear reactor and fabricating plutonium, generally avoiding political remarks or debate. Their tone and demeanor were professional. The North’s officials appeared open to a repeat visit by Dr. Hecker to help confirm what we had seen through additional observations and scientific measurements.

#### *Yongbyon Key Findings*

Dr. Hecker’s key findings based on our visit to Yongbyon are these:

- The 5 MWe reactor has been restarted. It appears to be operating smoothly providing heat and electricity, while also accumulating approximately 6 kg of plutonium per year in its spent fuel rods.
- The 50 MWe reactor construction site appears to have seen no activity since the IAEA inspectors were instructed to leave in 2002. The reactor and the construction site look in a bad state of repair. It would require a major construction program to fin-

ish the reactor. North Korea reports the future of the 50 MWe reactor is still “under evaluation.”

- The spent fuel pond is empty; the approximately 8000 fuel rods have been moved.
- The DPRK claimed to have reprocessed all 8,000 fuel rods to extract plutonium metal during one continuous campaign between mid-January 2003 and end of June 2003. We could not definitively substantiate that claim. However, the Radiochemical Laboratory staff demonstrated that they had the requisite facility, equipment and technical expertise, and they appear to have the capacity to extract plutonium from the spent fuel rods and fabricate plutonium metal. If all 8,000 fuel rods were reprocessed, the IAEA estimates they would provide 25 to 30 kg of plutonium.
- It is possible that they moved the 8,000 fuel rods to a different storage location. However, such storage would represent a serious health and safety hazard.
- We were shown what was claimed to be a sample of plutonium metal product produced last year. Dr. Hecker was not able to definitively confirm that the sample was actually plutonium metal, but all observations he was able to make were consistent with the sample being plutonium metal. However, Dr. Hecker was not able to prove that the samples were from the most recent reprocessing campaign. Such a determination requires more sophisticated measurements.
- In the foreseeable future, the DPRK can produce 6 kg of plutonium per year in its 5 MWe reactor. It easily has the capacity to reprocess the spent fuel at any time to extract the plutonium. It also has the capacity to reload the reactor with fresh fuel for a second and subsequent reloading. Unless North Korea has a clandestine nuclear reactor, it appears the DPRK is not in a position to increase the rate of plutonium production beyond 6 kg per year without a major construction project at the 50 MWe or 200 MWe reactor sites.
- Officials of the DPRK Ministry of Foreign Affairs claimed that the DPRK had weapons of mass destruction. They believe that they provided us with evidence of their “nuclear deterrent.” At Yongbyon, they demonstrated that they most likely had the capability to make plutonium metal. However, Dr. Hecker saw nothing and spoke to no one who could convince him that they could build a nuclear device with that metal, and that they could weaponize such a device into a delivery vehicle. We were not able to arrange meetings with DPRK staff who may have such expertise or visit related facilities.

#### HUMANITARIAN ISSUES

Upon arriving in Pyongyang, the staff delegation asked our host, Ambassador Li Gun, to arrange meetings on the topics of the Japanese abductee issue, prison camps in North Korea and their conditions, and food aid to the DPRK. These on-the-spot requests were all accommodated.

*Japanese Abductees*

In 2002, Kim Jong-il acknowledged to Japanese Prime Minister Koizumi that North Korean agents had abducted 13 Japanese nationals during the 1970's and 1980's. Japanese officials contend the number could go much higher. (South Korean officials estimate that several hundred South Koreans have been abducted by the North over the years, most never to return). The Japanese were abducted reportedly to teach Japanese language and culture to North Korean spies. At least five of the Japanese abductees remain alive and were returned to Japan last year following the Kim Jong-il-Koizumi summit. North Korean and Japanese officials continue to negotiate as to the fate of children and other relatives of these five, as well as eight additional Japanese abductees reported dead by North Korean authorities. North Korea has not provided evidence convincing to the Japanese that the remaining eight are deceased.

The North Korean official with whom we met on the abductee issue was Song Il-ho, Deputy Director of the Foreign Affairs Ministry for Japan. We emphasized that the United States' concern for the human rights situation in North Korea—including the fate of those abducted by North Korea and their families—reflects the deeply held convictions of the American people. We expressed our hope that North Korea would promptly take steps to fully resolve the issue, and explained the welfare of the abductees and their families was a matter of international concern and of particular interest to members of the Congress. We emphasized that we were not in North Korea to negotiate, but only to exchange views.

Song gave his government's perspective on the abductee issue, beginning with an overview of Japan-Korea relations from the colonial period to the present. After this background, Song acknowledged that North Korean secret agents did wrongly abduct Japanese nationals. "[They] did bring Japanese nationals to the DPRK. Thirteen were brought to the DPRK, some of whom have died of accidents or illness. Those responsible for bringing them here were charged under state law and punished."

After conveying his government's views, Song was forthcoming in answering questions we asked about the abductees and their relatives. He expressed his willingness to answer additional questions in the future. Song reported that Japan has been provided with videotapes and other information pertaining to the children and other relatives of the abductees remaining in North Korea. Song said that some of the abductees' children only recently became aware of the truth regarding their parents' origin, adding that the children have close relationships in his country, (including fiancées for some), have never been outside North Korea, and should be able to make individual decisions on whether they remain in North Korea or go to Japan. (Japanese officials counter that all abductees and their immediate relatives should be able to travel to Japan to live for a set amount of time before deciding on their own whether they would remain in Japan or return to North Korea.)

*U.S. Food Assistance to DPRK*

As we did last August, we met again this year with Jong Yunhyong, Director of the Flood Damage Reconstruction Committee, who is working with American and European non-government or-

ganizations (NGO's) and universities to expand efforts toward sustainable agriculture. During our meeting, Jong for the first time made reference to the topic of "rural development," indicating that NGO's may be designated to take charge of small to medium-sized rural development projects in the areas of energy and agricultural production.

Poor farming practices are evident in DPRK. Soybeans, corn and orchards planted vertically on mountainsides contribute to erosion. Poorly-built levees break during heavy rains causing fields to flood. There are often inadequate amounts of fertilizer, and the soil is over-worked. Double-cropping is practiced throughout the country. North Korea is interested in adopting better agricultural practices.

Although anxious to achieve food production self-sufficiency, Jong acknowledged emergency assistance will be needed for quite some time given the North's shortage of arable land. He expressed gratitude for the recent announcement from the U.S. of additional food aid. When the staff delegation once again questioned Jong on DPRK not allowing the World Food Program (WFP) to fully monitor food distribution and the lack of access to children, the elderly and pregnant women in 43 counties, he responded by advocating a shift away from food assistance and toward agriculture development projects.

Jong outlined the North's food production and distribution for 2003. He reported that the North produced 4.5 million metric tons of grain (primarily rice, corn, wheat, and barley). The DPRK calculates that after making allowances for food grain consumption, seed grain, livestock consumption, restaurant services, and spoilage, the North's production will fall roughly one million tons short of its needs for 2004. The Public Distribution System (PDS) largely broke down during the famine years of the mid-1990's, and has never fully recovered. Most North Koreans reportedly receive a meager allotment (300 grams/day) from the PDS, and must supplement their allotment with purchases of food from markets. Jong expressed his hope that the World Food Program and other donors would help close the gap between the North's production (including imports) and its actual food needs.

Kim Jong-il maintains a "military-first" policy in terms of food produced in North Korea, and Jong acknowledged that the military gets preferential access to the harvest. Once its needs are met, remaining food production enters the PDS. Given the minimal monitoring of bilateral South Korean and Chinese food aid (largely rice), we believe it is possible that North Korea may divert a portion of the rice from those two countries to meet any unfulfilled needs in the military for 2004, as it likely has in the past.

The United States provides food assistance to North Korea through the World Food Program (WFP), which targets its aid to the elderly, children up to the age of 10, and pregnant and nursing women. In February, 2003, the U.S. Government announced its intention to provide 100,000 tons of food assistance in calendar year 2003, with 40,000 tons to be shipped immediately and 60,000 tons to be shipped depending on circumstances inside North Korea and on competing global demands for assistance. On December 24, 2003, the administration announced it would ship the last 60,000 metric tons. This assistance package will reportedly include 38,000

metric tons of corn, 4,000 metric tons of non-fat dry milk, 6000 metric tons of corn-soya blend, 6000 metric tons of vegetable oil, with the remaining products including peas and beans. U.S. AID officials believe these food items are more apt to reach the hungry target groups than U.S. rice.

Most of the recipients of WFP aid live in urban areas outside of Pyongyang. WFP staff now conduct about 500 monitoring visits in North Korea per month, although most visits must be scheduled one week in advance and monitors are usually accompanied by North Korean officials. WFP has five field offices outside of Pyongyang. North Korea still does not permit WFP to feed the hungry in 43 out of 206 counties, mostly due to national security considerations. These off-limits counties are estimated to contain 15% of North Korea's population. WFP has no good information on the food needs of these counties, most of which are in mountainous regions of north-central DPRK or clustered along the border with South Korea (adjacent to the DMZ).

Over time, the WFP's ability to monitor its food aid deliveries has improved. WFP personnel are now able to obtain Korean-language training inside North Korea, and WFP has dramatically increased the number of monthly inspection visits over the past three years. WFP has also chosen to curtail food aid in Pyongyang. This is appropriate, as Pyongyang residents are typically better off than residents of other parts of North Korea. WFP has issued an appeal for 485,000 tons of commodities for 2004, a decrease from 513,000 tons sought for 2003. Only 300,000 tons of the amount requested for 2003 was actually received and distributed.

An extensive UN/DPRK nutrition survey conducted last year showed significant reductions in malnutrition among young children since 1998, a decrease due in large part to outside food assistance. However, even with gains in nutrition standards, *more than 40% of North Korea's children under the age of seven are markedly too short for their age—stunted—a condition largely irreversible with an impact on mental growth yet to be measured.*

### *The Gulags*

During our trip to North Korea last August, we raised the issue of the prison system and the poor conditions and high levels of malnutrition reported there with Vice Foreign Minister Kim Gye-gwan. An estimated 150,000–200,000 North Koreans reportedly are held under harsh conditions in hundreds of political detention camps. Last year, Kim Gye-gwan said that North Korean officials would allow non-government organizations (NGO) access to prison camps on a “case by case” basis.

During our recent trip to Pyongyang, we once again raised this issue with North Korean officials including Ambassador Li Gun and Jong Yun-Hyong, Director of the Flood Damage Rehabilitation Committee (FDRC). We advised North Korean officials that the U.S. Senate would be considering legislation later this year related to human rights conditions in North Korea and that deep concern exists regarding human rights abuses inside North Korea. The staff delegation also expressed concern about the status of North Korean refugees in China and the harsh treatment they sometimes receive upon returning to North Korea. We noted China's unwillingness to

establish a formal structure of assistance for refugees, and urged North Korean officials to cooperate with NGOs and other members of the international community seeking to address the humanitarian needs of this vulnerable population. Given Kim Gye-gwan's initial willingness to engage in discussions on this sensitive issue, the question of DPRK prisons and the conditions under which prisoners are held should be a matter for future discussions involving the United States and other countries.

#### ECONOMIC REFORMS

North Korea launched a major economic reform initiative on July 1, 2002. These reforms hold both promise and peril for the North Korean people generally and for the regime of Kim Jong-il. The government of North Korea has taken several steps to implement the reforms. Moreover, officials with whom we met recognize and acknowledge that North Korea's economic performance is ultimately tied to the peaceful resolution of the nuclear crisis.

##### *Background*

The main goals of the North's economic reform initiative are to boost production and improve living standards by introducing agricultural price incentives and stimulating the production of light industrial goods. The first step of the reform process emphasized raising wages and commodities prices to increase food production and decrease dependence on foreign aid. Subsequent reforms include new laws governing foreign investment and trade and a renewed emphasis on the development of three special economic zones—Sinuiju along the Chinese border, Najin-Sonbong on the east coast, and Kaesong Industrial Park, a joint venture with Hyundai located close to the DMZ and Seoul.

The 2002 reforms built on earlier initiatives—notably the 1998 Constitutional revision which for the first time recognized private ownership of “income obtained through legal economic activities”—while introducing several new concepts. Farmer income is now linked more closely to production, and small private plots are allowed to be planted alongside those plots allocated to state-directed food production. The state has taken steps to re-zone small plots into larger, more efficient plots, and introduced a variety of new seed technology and fertilizers. Similar initiatives in the industrial sector allow factories to shift production of goods once state quotas have been met—a kind of dual track system similar to that tried by China 30 years ago. Although ostensibly able to pursue new production, factories have no obvious source of capital for inputs, and they must still apparently maintain bloated work forces. In short, North Korea's antiquated industrial base is not well positioned to meet consumer demand for light industrial products.

It is not clear how much productive capacity will be freed up by reforms, or indeed, if North Korea's industrial sector is capable of producing items North Korean consumers want absent a significant injection of capital and know-how. New small, family-size business are beginning to provide services and produce goods, but it remains unclear whether these grass-roots initiatives can compensate for the lack of productivity from large, state-owned factories that remain under utilized and largely dormant.

For years, China has tried to encourage North Korea to follow its model of market socialism, but Pyongyang has proven reluctant, constrained by national pride and the *juche* (self reliance, independence) political philosophy. Since the launching of the July, 2002 economic reforms, however, DPRK officials have begun to study China's success more closely. But even as it begins to embrace market principles, the North's economic prospects remain hampered by resource constraints. The North suffers from chronic shortages of electricity, food, material resources (especially timber and coal), capital, technology, and trained administrative personnel. These constraints serve as a brake on the pace of economic growth. The net result is a reform package that remains inchoate, but nonetheless significant.

### *Markets Sprout*

Perhaps the most significant aspect of the July 2002 economic reform package was the introduction of "general markets" at which farmers could sell their produce and craftsman could sell their wares. Until recently, these markets have been rather rudimentary, consisting of large open-air stalls enclosed by some kind of fencing, and they have been strictly off limits to foreigners. That is changing. Farmers markets are evolving into general markets. In recent months, the North has taken the concept of the market to its next logical evolution—a large, covered, regulated market, complete with foreign exchange service, a café, and a wide variety of both domestic and imported consumer goods. The "fire wall" that used to separate markets for food and markets for goods has been breached.

We visited Pyongyang's "flagship" general market: the Tong-il Street Market. It must be noted that the Tong-il Street market is not typical, and that Pyongyang as a whole is not representative of conditions elsewhere in North Korea. Therefore, one cannot draw conclusions about market conditions throughout North Korea based only on a visit to one market in Pyongyang. That said, the Tong-il Street market, completed last summer, appears to be in the vanguard of market reform in North Korea, and was presented to the delegation as a clear indication of where North Korea wants to go.

The Tong-il Street Market has more than 500 vendors, each renting stall space from the Tong-il Street Market for 80 won a day (about \$3 month). Vendors sell a huge variety of food imported from China, including pineapple, bananas, and melons. They also sell Fuji apples from Japan—seven for one dollar—and Russian vodka. In addition to food, shoppers can find clothing, shoes, consumer electronics, major appliances, furniture, artwork, etc.

Unlike the markets set aside for senior Korean Workers Party officials, the Tong-il Street Market appears to be open to the general public. There are no ID checks and no armed security guards. The market was bustling when we visited. Pyongyang residents typically tend to be a better off than residents of other parts of the country, but given the prices for most goods, there is no reason to believe that similar markets would not attract shoppers elsewhere in urban North Korea. We saw vendors accepting a variety of currencies—Chinese Renminbi, Japanese Yen, American Dollar, Euros—and gladly taking the opportunity to negotiate a favorable

exchange rate with an unwary shopper. Vendors appeared to have the ability to provide change in several currencies. One dollar traded for 1,000 DPRK Won at the stalls, slightly above the official rate of 900 Won/dollar, but below the “floating” black market rate of roughly 1,200 Won/dollar. Vendors bargained with enthusiasm and exhibited considerable entrepreneurial spirit.

Are these kinds of markets the future for North Korea? It is too soon to say. The Tong-il Street market was opened last August, and plans call for similar markets to be constructed in each of Pyongyang’s 21 districts and then throughout the country. These covered, climate-controlled markets are intended gradually to replace the open-air markets that continue to cater to buyers with more limited income. Large markets are part of the story of North Korea’s market reform initiative. In Pyongyang, we also observed new small vendor stalls launched since last summer. We saw similar stalls last summer in Nampo and in Yongbyon city this year. These street stalls, selling a variety of small snacks, cigarettes, and liquor, appear popular, and have grown steadily in number over the past two years. For the first time, we were able to make a purchase at one of these street stalls—five Chinese chocolate bars for a dollar. The vendor smiled as she took our one dollar bill, but also seemed a bit wary of making a sale to a foreigner.

#### *Economic Prospects*

North Korea has a shortage of economic expertise at all levels of government, but is beginning to take steps to remedy that deficiency. Interestingly, China has begun training programs for DPRK economic officials under the auspices of the Chinese Academy of Social Sciences. Chinese officials and think tank specialists report a new willingness on the part of their DPRK counterparts to learn from China’s experiences with economic reform and the privatization of state-owned enterprises.

North Korea’s economic reforms are not without risk. In the short run, price adjustments could increase inequality and exacerbate existing social differentiation. North Korea has long maintained an elaborate system of preferences, and the “haves” are now even more distant from the “have nots.” Inflation has also become a major concern. Some initiatives—such as a zero interest 10-year bond with lucky lottery winners eligible for “bonus interest”—at first blush seem ill-considered or downright Orwellian. However, bonds could in the long run provide a vehicle for privatizing state assets through debt-equity swaps as occurred in the former Soviet Union.

If North Korea is able to stimulate agricultural production and create functioning markets, it may not be enough to turn around its ailing economy. North Korea is primarily an industrial society, with roughly 70 percent of the population residing in cities. Building a viable light industrial sector in North Korea and making obsolete heavy industries productive will require major restructuring and large infusions of capital and technology.

In sum, reforms in North Korea may create as many “losers” as “winners,” at least in the short run, and this could eventually undermine social stability. Reforms designed to boost commodity prices may be good for farmers and those with access to hard cur-

rency, but for urban dwellers on fixed income, the price increases for food and the devaluation of the North Korean Won against the dollar exact a heavy toll. The Won has gone from 150 Won/dollar in 2002 to 900 Won/dollar in October, 2003, with unofficial “black market” rates reaching as high as 1200 Won/dollar. The state seems aware of this problem, and has boosted salaries for miners and members of the armed forces—presumably two sectors of the work force the government must keep happy to avoid major unrest.

While it is too soon to judge whether North Korea’s economic reforms will kick-start its economy, there is no doubt that the state is committed to the reforms and is pursuing them with gusto. Success may depend in large measure on whether North Korea can solve the nuclear crisis and gain access to foreign capital, investment, and trade.

#### BEIJING, SEOUL AND TOKYO

Upon departing Pyongyang, and en route back to the United States, we met with U.S. and respective country officials in China, South Korea, and Japan to answer questions regarding details of our visit to the DPRK. While all the parties to the six party talks share the goal of a non-nuclear Korean Peninsula, each nation brings its own priorities to the talks. Officials in Beijing, Seoul, and Tokyo, each shared their country’s particular concerns with the staff delegation. We gained a deeper appreciation for the special responsibility China feels as host and facilitator of the talks, and were reminded of the priority Seoul attaches to the maintenance of peace and stability on the peninsula as this diplomatic process moves forward. In Tokyo, we gained insights into the incredibly important issue of the abductees, and how it informs Japanese policy making as Tokyo participates in the talks.

#### CONCLUSIONS/KEY FINDINGS

1. DPRK officials believe the United States will launch a preemptive attack on their country.
2. North Korea has restarted its Yongbyon nuclear reactor which has the potential to produce 5–6 kilograms of plutonium per year. The North could at any time easily reprocess spent fuel from the reactor to harvest plutonium for use in nuclear bombs.
3. North Korea is in the midst of a significant economic reform movement, the full implications of which remain to be seen. North Koreans intimately involved with the reform initiatives appear to be among those in the DPRK pushing the hardest for resolution of the nuclear issue.
4. DPRK officials are interested in reducing the nation’s dependence on food aid and want outside help developing a more productive agriculture sector.
5. Eliminating North Korea’s gulags and addressing the humanitarian needs of North Korea’s prison population should become a priority for the United States government and the entire international community.

6. Significant communications and coordination problems continue to hamper the six party talks. The talks are more likely to make progress if multi-party working groups are established to define terms, discuss verification protocols, and exchange views on how any deal might be phased.
7. China and South Korea place a premium on maintaining peace and stability on the Korean Peninsula. Both seem prepared to go to great lengths to avoid either a war on the peninsula or an abrupt collapse of the Kim Jong-il regime.
8. China, on whom we rely as key facilitator in the six-party talks, shares our goal of a non-nuclear Korean Peninsula. Nonetheless, China will always place its own interests first in this process, and Beijing's interests are not identical to our own. DPRK officials are not certain that China has accurately transmitted messages between Washington and Pyongyang.

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KEY INTERLOCUTORS INCLUDE THE FOLLOWING:

*People's Republic of China*

John Aloisi, Political Counselor, U.S. Embassy  
 Donald Steel, Political Officer, U.S. Embassy  
 Wang Shenghong, Director, Foreign Affairs Bureau of the National Committee of the Chinese People's Political Consultative Conference  
 Xia Jihui, Deputy Director, Foreign Affairs Bureau of the National Committee of the Chinese People's Political Consultative Conference  
 Cao Huayin, Deputy Secretary-General, China Reform Forum  
 Ding Kuisong, Vice Chairman, China Reform Forum  
 Dai Fengning, Program Officer, China Reform Forum  
 Yu Meihua, Director of East Asia Studies, China Reform Forum  
 Maj. Gen. Pan Zhenqiang (Ret.), Professor, Institute for Strategic Studies, National Defense University  
 Ning Fukui, Ambassador for Korean Peninsula Issue, Ministry of Foreign Affairs  
 Li Yang, Deputy Director, Office for Korean Peninsula Issue, Ministry of Foreign Affairs  
 Tu Jingchang, Deputy Director, Office for Korean Peninsula Issue, Ministry of Foreign Affairs  
 Liu Xuecheng, Director of American Studies, China Institute of International Studies

*North Korea*

The Honorable Paul Beijer, Ambassador, Embassy of Sweden  
 The Honorable Wojciech Katuza, Embassy of Poland  
 The Honorable Doris Hertrampf, Ambassador, Embassy of Germany

The Honorable David Slinn, Ambassador, Embassy of Great Britain  
 Ri Hak-gwon, Vice President, Committee for the Promotion of International Trade  
 Professor Doctor Ri Mun-ho, Head of Counsellors for Science, Academy of Sciences DPRK  
 Dr. Jong Hun-il, Senior Officer, Bureau of International S & T Cooperation, Academy of Sciences  
 Jong Yun-hyong, Director, Flood Damage Reconstruction Committee  
 Kim Gye-gwan, Vice Foreign Minister, Ministry of Foreign Affairs  
 Ambassador Li Gun, Deputy Director General, North America Division, Ministry of Foreign Affairs  
 Dr. Ri Hong-sop, Director, Yongbyon Nuclear Scientific Research Center  
 Choi Kil-man, Deputy Director, Yongbyon Nuclear Scientific Research Center  
 Sung Il-ho, Deputy Director, Japan Division, Ministry of Foreign Affairs  
 Col. General Li Chol Bok, Korean People's Army

*South Korea*

The Honorable Thomas Hubbard, U.S. Ambassador  
 Sangmin "Simon" Lee, Control Officer, U.S. Embassy  
 Scott Snyder, Asia Foundation  
 Rhee Bong-Jo, Chief, Policy Coordination Bureau, National Security Council  
 Park Sun-won, Ph.D., Senior Director, National Security Council  
 Park Ro-byug, Senior Director, National Security Council  
 Park Chan-bong, Ph.D., Deputy Assistant Minister for Unification Policy, Ministry of Unification  
 Wi Sung-lac, Director General, North American Affairs, Ministry of Foreign Affairs  
 Yang Chang-seok, Director, International Cooperation Office, Ministry of Unification  
 Jun Bong-geun, Policy Advisor, Ministry of Unification

*Japan*

The Honorable Howard Baker, U.S. Ambassador  
 Torkel Patterson, Minister-Counselor, Senior Advisor to the Ambassador (U.S.)  
 Richard A. Christenson, Deputy Chief of Mission, U.S. Embassy Tokyo  
 Daniel L. Shields, Political Section Deputy and Foreign Policy Unit Chief, U.S. Embassy Tokyo  
 Ken Moskowitz, Director, Tokyo American Center  
 David Jonathan Wolff, Embassy Control Officer, Bilateral and Foreign Policy Unit, Political Section, U.S. Embassy Tokyo

Yasumasa Nagamine, Deputy Director General, North American Affairs Bureau, Ministry of Foreign Affairs  
 Kazuhiro Suzuki, Senior Policy Coordinator, Foreign Policy Bureau, Ministry of Foreign Affairs  
 The Honorable Shinzo Abe, Secretary General, Liberal Democratic Party  
 Mikio Mori, Director for Multilateral Nuclear Cooperation, Foreign Policy Bureau  
 Naoki Ito, Director, Northeast Asia Division, Asian and Oceania Affairs Bureau, Ministry of Foreign Affairs  
 Mitoji Yabunaka, Director General, Asian and Oceania Affairs Bureau, Ministry of Foreign Affairs  
 Akitaka Saiki, Deputy Director General, Asian and Oceania Affairs Bureau, Ministry of Foreign Affairs  
 Koji Tsuruoka, Deputy Director General, Foreign Policy Bureau  
 Nobuyuki Takakura, Director, Economic Affairs Division, Health Policy Bureau, Ministry of Health, Labour and Welfare  
 Kaoru Manabe, M.D., Deputy Director, Economic Affairs Division, Health Policy Bureau, Ministry of Health, Labour and Welfare

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PREPARED STATEMENT OF DR. SIEGFRIED S. HECKER, SENIOR FELLOW, LOS ALAMOS NATIONAL LABORATORY, UNIVERSITY OF CALIFORNIA

[PRESENTED TO THE U.S. SENATE COMMITTEE  
 ON FOREIGN RELATIONS, JANUARY 21, 2004]

Mr. Chairman, distinguished members of the Committee, I am honored to share with you my report of a rather unexpected and extraordinary visit to the Yongbyon Nuclear Scientific Research Center in North Korea (the Democratic People's Republic of Korea). I will submit a written statement for the record and summarize my observations this morning.

*Background*

I visited the Democratic People's Republic of Korea (DPRK) and the Yongbyon Nuclear Scientific Research Center as part of an unofficial U.S. delegation led by Professor John W. Lewis of Stanford University. Professor Lewis is an Asian scholar at Stanford, specializing in China and North Korea. Professor Lewis' visit was part of his ongoing dialog with officials of the DPRK concerning the North's nuclear program. He has visited the DPRK ten times since he began this dialog in 1987. He last visited the DPRK just before the official six-party talks in Beijing last August. DPRK officials invited him to return. When they indicated that they may allow him to visit the nuclear facilities at the Yongbyon Nuclear Scientific Research Center, he contacted me to accompany him to provide scientific expertise. Since I work for the Los Alamos National Laboratory, which is operated by the University of California for the Department of Energy, I requested and received the necessary U.S.

Government approvals for travel to China and the DPRK. I have known Prof. Lewis for approximately 15 years. We have collaborated on other global security issues.

Joining our delegation at Prof. Lewis' invitation was Charles L. (Jack) Pritchard, Visiting Scholar at the Brookings Institute and formerly the U.S. special envoy for DPRK negotiations. In addition, two Senate Foreign Relations Committee experts on Asian affairs, Mr. W. Keith Luse and Mr. Frank S. Jannuzi, had separately planned a trip to the DPRK. They joined our delegation in the DPRK and participated in our visit to the Yongbyon Nuclear Scientific Research Center.

The host organization for our visit was the DPRK Ministry of Foreign Affairs. Ambassador Li Gun accompanied us during the entire visit. Vice Minister Kim Gye Gwan met with us on three separate occasions. In addition to the visit to the Nuclear Scientific Research Center, Prof. Lewis had arranged other meetings with DPRK officials to cover economic, military, and science issues. Mr. Luse and Mr. Jannuzi arranged some additional meetings on their own. I will restrict my written statement to the areas of my expertise, namely the nuclear issues. More specifically, I will focus on what we learned during the visit to the Yongbyon Nuclear Scientific Research Center.

*DPRK Statements and Motivation to Set the Context for the Visit*

Vice Minister Kim [Gye Gwan] indicated that they were very interested in resuming the six-party talks. The DPRK made a proposal on Dec. 9, 2003 to freeze its nuclear activities and received no response from the United States. Vice Minister Kim indicated that they have just repeated this proposal, and this time Secretary Powell responded positively. [The following quote from Secretary Powell appeared in AFP, January 7, 2004: "This is an interesting step on their part, a positive step, and we hope that it will allow us to move more rapidly to six-party framework talks. I am encouraged, I am encouraged by the statement the North Koreans made."]

Vice Minister Kim stated, "The most reasonable way [to proceed] is to have simultaneous action steps. . . . The U.S. says it will give us a security assurance if we dismantle our nuclear program. We say it differently. The first step would be a freeze of the present [DPRK] nuclear activities. You will see how important a freeze will be when you are at Yongbyon. This means there will be no manufacturing, no testing, and no transferring of nuclear weapons."

Vice Minister Kim stated, "We view the delegation's visit to Yongbyon as a way to help contribute to breaking the stalemate and opening up a bright future. We will not play games with you. We have invited you to go to Yongbyon. The primary reason for this is to ensure transparency. This will reduce the assumptions and errors. . . . This visit can have great symbolic significance."

"We want you to take an objective look, and we will leave the conclusions to your side. This is why the inclusion of Dr. Sig Hecker is so significant." Mr. Pritchard stated that we are unofficial and that we are not an inspection team. Kim continued, "Hecker's presence will allow us to tell you everything. This is an extraordinary approval by us. . . . We, too, emphasize that you are

not making an inspection. But, because we are allowing this visit, we will provide you enough access to have good knowledge.”

Vice Minister Kim indicated that based on the U.S. actions in November 2002, the DPRK decided that the Agreed Framework was no longer in its interest, so it terminated the IAEA [International Atomic Energy Agency] inspections and withdrew from the NPT. The DPRK decided to operate the 5 MWe reactor and resume reprocessing of plutonium for peaceful nuclear activities. He stated, “It is the only way to keep the spent fuel rods safe.” He added, “At the same time, the hostile U.S. policy had been intensified. So, we changed our purpose and informed the U.S. that the plutonium that was to have been used for peaceful purposes would now be used for weapons. Originally, we had wanted to keep the reprocessed plutonium in a way we could store it safely. Then, we changed the purpose in order to strengthen our deterrent.”

Vice Minister Kim added that the DPRK wants a peaceful resolution of the nuclear crisis. They want a denuclearization of the Korean Peninsula. He emphasized that the DPRK has been very flexible and very patient, adding, “I should note that the time that has been lost [in dealing with us] has not been beneficial to the U.S. side. With an additional lapse in time, our nuclear arsenal could grow in quality and quantity. The outcome has not been a success for the U.S.”

I provide this political background to set the context for potential motivations for the DPRK decision to invite us to visit the Nuclear Scientific Research Center. They have publicly stated that they have reprocessed the fuel rods to extract plutonium and strengthen their “deterrent.” It appears they were concerned that the United States (and perhaps others) did not believe them. So, they may have invited us to provide independent confirmation of their claims.

However, Vice Minister Kim also expressed a concern about their decision to invite us to Yongbyon. He stated: “If you go back to the United States and say that the North already has nuclear weapons, this may cause the U.S. to act against us.” At a later meeting, he returned to this concern by stating, “We are concerned that the U.S. Government will use what you conclude [as a pretext] to attack us. The U.S. might claim that this visit proves that the DPRK has crossed a red line when it restarted the reactor. Can we be sure that the U.S. will refrain from action if it declares that we have gone beyond its red line—such as finishing of the reprocessing and the change in the purpose of the reprocessing [from peaceful safety-related reasons to making weapons]?”

So, I believe the DPRK wanted to show us the Yongbyon Nuclear Scientific Research Center to verify that they had taken significant actions since December 2002 and to impress us with their nuclear capabilities. The Center leadership and its specialists were very cooperative within the boundaries of what they were authorized to show us. Nevertheless, DPRK officials had reservations about our visit and they recognized the risks involved. They obviously decided the potential benefits of our visit justified taking the risks.

*My Motivations for Going to the DPRK*

I explained to our DPRK hosts my decision to accept Prof. Lewis' invitation to join him on this trip. I have been concerned about the ambiguities associated with the DPRK nuclear program. I realize that some of the ambiguities may be deliberate. However, ambiguities often lead to miscalculations, and in the case of nuclear weapons related matters, such miscalculations could be disastrous. So, I had hoped that as a scientist I could help to bring some clarity to the DPRK nuclear situation by visiting the Yongbyon Nuclear Scientific Research Center.

I also stated that I believe the role of scientists (and I should add engineers) is very important to the diplomatic process. I see three important roles. First, to bring clarity to the issues so as to facilitate a diplomatic solution to the nuclear crisis. Second, if a diplomatic solution is found, scientists must help to implement any solution such as a freeze or eventual denuclearization. Third, scientists will be crucial to help verify any such solution. So, it is my hope that my visit might be a small step in this direction.

*Logistics of the Visit to the Yongbyon Nuclear Scientific Research Center*

On Thursday, January 8, 2004, all five members of our delegation visited the Center, which is near the town of Yongbyon, roughly 100 km north of the DPRK capital of Pyongyang. We were accompanied by Ambassador Li Gun, an official from the General Bureau of Atomic Energy and a security escort. We were greeted by Professor Dr. Ri Hong Sop, Director of the Nuclear Scientific Research Center. The Center reports to the General Bureau of Atomic Energy. Also present at our introductory briefing were Choi Ku Man, assistant director of the center, Li Yong ho, safeguards section head, Kim Haik Soon, senior center researcher, Pak Chang Su, center researcher.

At the Yongbyon Nuclear Scientific Research Center, Director Ri [Hong Sop] toured us through the following facilities:

- The Experimental Nuclear Power Plant (the DPRK name for what we call the 5 MWe [5 megawatt electric] reactor). We were toured through the control room and the observation area for the reactor hall. This facility is inside the first security area of the Yongbyon facility. Our guide was Chief Engineer of the facility, Li Song Hwan.
- The spent fuel storage pool building next to the 5 MWe reactor, also guided by Chief Engineer Li Song Hwan.
- Drive by (twice) of the 50 MWe reactor site. Inside the second high-security area of the Yongbyon facility.
- Radiochemical Laboratory—3rd floor corridor that allowed for viewing of the hot cell operations through shielded glass windows and a conference room. (This facility is also inside the second high-security area). Our guide was Chief Engineer of the Radiochemical Laboratory, Li Yong Song.
- Guest House for introductory and wrap-up discussions with Center facility leadership.

Our hosts drove us from Pyongyang to the Yongbyon facility. We left the hotel at 8:30 a.m. and returned shortly before 7:00 p.m. We spent from 10:30 a.m. to 5:15 p.m. at the facility,

*Observations From the Visit: What We Were Told and What We Saw*

I will present my observations for each facility. I will first summarize what we were told by the Center leadership (shown in italics) and then summarize my observations (in regular font). The director and the two chief engineers each stated that it was U.S. actions that forced the DPRK to take steps to resume nuclear operations.

*THE 5 MWE REACTOR. They stated that they have restarted only the Experimental Nuclear Power Plant (the 5 MWe reactor). The plant was restarted in February 2003. It now is operating smoothly at 100% of its rated thermal power. They are producing electricity and heat from the reactor now for their town. The reactor is the main source of heat for the town now that the 10,000 metric tons (tonnes) of heavy fuel oil supplied annually to their region (as part of the 500,000 tonnes agreed to in the Agreed Framework) has been cutoff.*

We confirmed that the 5 MWe reactor is operating now. We were shown the control room and the reactor hall. All indications from the display in the control room are that the reactor is operating smoothly now. The steam plume emanating from the cooling tower [visible both in the morning and afternoon] confirmed operation. However, we have no way of assessing independently how well the reactor has operated during the past year.

*The length of time the reactor is expected to operate with the current load of fuel depends on how the situation with the United States develops. They do not have safety concerns about running the reactor for a long time [implying years]. They stated that some of the operational problems experienced previously have been corrected. However, they are prepared to reprocess the current fuel at any time.*

We commented to our hosts that in addition to producing electricity and heat the reactor is also producing new plutonium. Best estimates are that under current reactor operations approximately 6 kg of plutonium is produced annually in the spent fuel.<sup>1</sup> The reactor may currently contain approximately 6 kg of plutonium in the spent fuel rods, and it will continue to produce an additional 6 kg each year assuming the reactor operates efficiently.

*They stated that have one more charge of fuel for the reactor fabricated now. The fuel fabrication facility is partially operational and partially under maintenance. They are in no hurry to fabricate more fuel since the two bigger reactors under construction are not close to operation.*

We did not have the opportunity to visit the fuel fabrication facility. However, these comments are consistent with previous U.S. estimates. In previous years, the fuel fabrication complex was reported to be making fuel elements containing about 100 tonnes per year of uranium. The complex is believed to have produced enough fuel for the initial loading of the core for the 50 MWe reactor under construction. Moreover, the nominal capacity was appreciably larger.<sup>1</sup>

50 MWE REACTOR. *They told us that construction stopped in 1994. They stated that at that time it was within one year of completion. Nothing has been done since. They are currently evaluating what to do with the reactor.*

We drove past the 50 MWe reactor site twice. We confirmed that there is no construction activity at this site. There were no construction cranes on site. The reactor building looks in a terrible state of repair. The concrete building structure showed cracks. The steel exhaust tower was heavily corroded, as was other steel equipment on the site. The building was not closed up and resembled a deserted structure. The NSC director expressed his great dismay about the deterioration of the facility because of the eight-year freeze. This reactor is much more than one year from completion now. It is not clear how much of the current structure can be salvaged.

200 MWE REACTOR AT TACHEON. (This reactor site is 20 km from Yongbyon.) *They stated that construction also stopped in 1994. They are also evaluating what to do with the reactor.*

This reactor location is at a different site. We were not able to assess the current situation.

SPENT FUEL STORAGE BUILDING. *They stated that they removed all 8,000 fuel rods from the spent fuel storage pool and shipped them to the Radiochemical Laboratory (plutonium reprocessing facility) and reprocessed them [to extract the plutonium]. The fuel rods were taken out of the pool in Korean containers (metal baskets) and placed in specially shielded shipping casks. During the removal of the fuel rods they found that about half of the U.S. canisters had leaked during storage. But they claimed not to have experienced major problems getting the spent fuel rods out of the pool and transporting them in special casks by truck daily to the Radiochemical Laboratory for reprocessing.*

These are the spent fuel rods that the DPRK had removed from the 5 MWe reactor after it ceased operation in 1994 as part of the Agreed Framework. In 1995, a few months after the Agreed Framework was signed, preparations for the canning began. The process turned out to be quite involved and was not finished until June 2000. During this time, the United States Department of State and Department of Energy (supported by the Pacific Northwest National Laboratory and the Nuclear Assurance Corporation) worked jointly with the DPRK to package these rods in 400 U.S. supplied stainless steel canisters to store safely (with dry inert gas inside the canisters) in a deep pool of water (for radiation shielding) to allow the radioactivity level of the rods to decrease with time. This facility was fitted with various devices and seals by IAEA inspectors to ensure that the fuel rods would not be tampered with. However, the IAEA inspectors were dismissed by the DPRK in December 2002. Only DPRK personnel have had access to the Nuclear Scientific Research Center since that time.

Our initial look into the spent fuel pool showed that the locking plates and associated structures that the U.S. Spent Fuel Team had put in place after the canisters (loaded with the 8,000 fuel rods) were inserted into the pool were gone. We immediately confirmed the fact that all fuel rods were no longer in the pool because many of the canisters were missing and many were open. The

building was not heated, and we found a thin sheet of ice on the pool surface. When I expressed concern that some of the canisters were still closed, they took the extraordinary step of allowing me to pick one at random and open it [all done under water in the pool] to demonstrate that there are no fuel rods remaining, even in the closed canisters. The randomly selected canister did not contain any fuel rods (it initially contained 20). This and other observations convinced me that the spent fuel pool is empty; the fuel rods are gone. It is possible that they moved the 8,000 fuel rods to a different storage location. However, such storage would represent a serious health and safety hazard. [During the tour of the Radiochemical Laboratory, I asked if we could visit the Dry Storage Building, which serves as the port of entry for the fuel rods into that laboratory; they said that it was not available for a tour because their was no activity, and there were no workers in the building.]

*RADIOCHEMICAL LABORATORY. They stated that they reprocessed all 8,000 spent fuel rods in the Radiochemical Laboratory in one continuous campaign, starting in mid-January 2003 and finishing by the end of June 2003. They stated that their capacity in the Radiochemical Laboratory is 375 kg uranium per day (they said they worked four 6-hr shifts around the clock). They later added that the reprocessing capacity of the facility under normal operating conditions is 110 tonnes of spent uranium fuel per year. Therefore, they were able to finish the current campaign of 50 tonnes of spent fuel rods in less than six months. They told us that we would tour the corridor next to the hot cells in which the reprocessing occurs. The campaign is complete; the facility is not operating now. Everything has been cleaned up, and there is no radiation hazard in the corridor.*

At the Radiochemical Laboratory we confirmed that they possessed an industrial scale reprocessing facility. The facility appeared in good repair. They demonstrated the requisite facilities, equipment, and technical expertise required for reprocessing plutonium at the scale in question. They use the standard PUREX (plutonium uranium extraction) process for separating plutonium from the fission products and uranium fuel. They answered all our technical questions about the reprocessing chemistry very competently. We were not able to see the glove boxes used for the final plutonium purification and production. They indicated that these were downstairs and not part of today's tour. In his book, Albright stated that five glove boxes were used during this process to produce plutonium dioxide product. He also reported that one or two glove boxes may have been removed before inspectors were permitted on site.<sup>1</sup> These boxes could presumably have been used to process plutonium dioxide [the typical plutonium product from the reprocessing operation] into metal and to cast or shape plutonium metal. Based on our tour we are not able to confirm or deny that the facility operated during the first half of 2003.

*They stated that the Radiochemical Laboratory was built through their own efforts. They began construction in 1986 and the main parts were completed by 1990. At that time they ran a "hot test" of the facility with 80 fuel rods and natural uranium rods to extract 60 grams of plutonium.*

Albright reported that the hot test involved 86 fuel rods irradiated in the 5 MWe reactor combined with 172 fresh fuel rods. He also reported that in 1992 the DPRK presented plutonium oxide containing about 62 grams of plutonium to the IAEA inspectors. However, the total amount of plutonium actually processed by the DPRK before IAEA inspections began in 1992 is still strongly disputed.<sup>1</sup>

*When asked about the disposition of the waste stream, they stated that the waste from the most recent reprocessing campaign was mixed in with the waste from the "hot test" of the 80 fuel rods processed in spring of 1990.*

We were not able to visit the waste facilities and, hence, cannot confirm this statement. Even if we had toured the facility, we could not make a judgment without sophisticated sampling and measurements of the nuclear wastes. However, this type of information is important for tracing the reprocessing history of the facility.

*They stated that they initially intended to run the fuel cycle for civilian purposes (which means they would have stored the plutonium product as plutonium dioxide) but because of the hostile U.S. actions, they reprocessed the entire campaign to plutonium metal. They stated that this processing was done in the Radiochemical Laboratory by installing some glove boxes that were not present during IAEA inspections. It took them three months to install the equipment and prepare it for the plutonium metal processing step.*

We were not able to see the glove boxes for the final plutonium operations. However, their comments indicated that they had glove boxes for plutonium metal production ready to go. This indicates that they had experience making plutonium metal before the IAEA inspections began in 1992. Albright<sup>1</sup> estimated that the 8,000 spent fuel rods in question could yield between 25 and 30 kg of plutonium metal.

*Although we could not see the plutonium glove box operations, they took the extraordinary step of showing us the "product" from what they claimed to be their most recent reprocessing campaign. In a conference room following the tour, they brought a metal case that contained a wooden box with a glass jar they said contained 150 grams of plutonium oxalate powder and a glass jar they said contained 200 grams of plutonium metal for us to inspect.*

The glass jars were fitted with a screw-on metal lid and were tightly taped with transparent tape. (The plutonium's alpha-radiation is easily stopped by the glass jar). The green color of the plutonium oxalate powder is consistent with plutonium oxalate that has been stored in air for some time. The plutonium metal was a thin-walled (approximately 1/8-inch thick) funnel (approximately 2-inch diameter at the base and 1-inch diameter at the top, approximately 1 1/2 inches high) that they claimed to have been scrap from a casting from this reprocessing campaign. When asked about its density, they responded, "between 15 and 16 g/cubic centimeter and that it was alloyed [a practice common in plutonium metallurgy to retain the  $\delta$ -phase of plutonium which makes it easier to cast and shape]. The metal surface and color were consistent with moderately oxidized plutonium metal from a casting (I believe it could not have been in the jar for a period of many weeks because it did not show any loose oxide powder). I tried to get a feel for the den-

sity and heat content of the alleged plutonium metal by holding the glass jar in a gloved hand. The glass jar (very thick walled) was reasonably heavy and slightly warm (importantly, however, it was definitely not cold as was everything else in this building). The bottom line is that with the rather primitive tools at hand I was not able to definitively identify the purported metal and the powder as plutonium. It was radioactive, however, because a radiation probe (which appeared to be a Geiger counter [Geiger-Müller detector]) registered a count when turned on near the wooden box containing the glass jars. With a few relatively simple tests, we would be able to positively identify the product as plutonium metal, but that was not possible to do during this visit.

Furthermore, even if we could confirm that the product we were shown is plutonium, we would not have been able to confirm that it came from the most recent campaign without additional, more sophisticated isotopic measurements that would let us identify the age of the plutonium. The director of the NSC confirmed this by stating, “*you would have to measure the americium to plutonium-241 ratio to determine its age.*” He was correct.

*When asked about the isotopic content of the plutonium, specifically its Pu-240 content, they stated, “the plutonium-240 content from this campaign is low, but we are not authorized to tell you. The IAEA knows, you can ask them.”* We were in no position to assess the isotopic content of the plutonium produced or that shown to us.

*They also stated that the plutonium metal was alloyed, but they were not authorized to tell us what alloying element was used [they did add, you know what it is, and we do it the same].* We were in no position to tell whether or not the plutonium metal shown to us was alloyed. However, the fact that it was not cracked and that their specialists claimed that the plutonium had a density between 15 and 16 grams/cubic centimeter is consistent with plutonium alloyed with approximately 1 weight percent of gallium or aluminum. A calculation of the rough dimensions and weight is also consistent with these values. However, the uncertainty in my observations is very large.

Mr. Luse asked about a concern of yours Mr. Chairman; that is, the security of their nuclear materials. Director Ri responded, “*Be at ease with this problem. I am not authorized to give you an explanation on this, but we feel certain that the protection and safety—the security—are good.*”

*We were also told that the effects of another freeze or decision to denuclearize would have devastating effects on the work force. Director Ri indicated that all of his people, including he, would have to look for new jobs.*

*Other observations and comments related to the nuclear issues*

**The DPRK “deterrent.”** During follow-up discussions with Ambassador Li and Vice Minister Kim in Pyongyang, they stressed that the DPRK now has a nuclear deterrent and that U.S. actions have caused them to strengthen their deterrent—both in quality and in quantity. Ambassador Li inquired if what I had seen at Yongbyon convinced me that they had this deterrent.

I explained to both of them that there is nothing that we saw at the Yongbyon Nuclear Scientific Research Center that would allow me to assess whether or not the DPRK possessed a nuclear deterrent if that meant a nuclear device or nuclear weapon. We found that both in our visit and in previous declarations by the government of the DPRK that the term “deterrent” was used in a very ambiguous manner.

I explained that I view a “deterrent” to have at least three components: (1) The ability to make plutonium metal, (2) the ability to design and build a nuclear device, and (3) the ability to integrate the nuclear device into a delivery system. What we saw at Yongbyon was that they apparently have the capability to do the first. However, I saw nothing and talked to no one that allowed me to assess whether or not they have the ability to design a nuclear device. And, of course, we were not able to assess the integration into a delivery vehicle. Moreover, during additional discussions I cautioned that “deterrence” might have worked between the United States and the Soviet Union, two equally armed nuclear superpowers under rather predictable circumstances. The concept of nuclear deterrence may have little meaning for the U.S.–DPRK situation. I asked Ambassador Li in the late morning of the last day of our visit if I could meet individuals who could talk to me in some detail about their “deterrent” in the spirit that I had just described. He said he would try, but that evening told me that the time was insufficient to make such arrangements.

**HIGHLY-ENRICHED URANIUM ISSUE.** In the Foreign Ministry, we discussed the contentious issue of DPRK’s supposed admission on October 4, 2002, to having a clandestine highly enriched uranium (HEU) program in violation of the letter and spirit of the 1994 Agreed Framework. There is a controversy about whether the DPRK admitted to having such a program at a meeting with U.S. officials. The disagreement concerns a difference between what DPRK officials believe they said and what U.S. officials believe they heard. DPRK officials provided us with a copy of the Korean text of what Vice Foreign Minister Kang Sok-ju said at the meeting. Regardless of how this issue is eventually clarified, one will still have to deal with the facts.

During our meeting, Mr. Pritchard stated, “The key issue is the intelligence that makes the United States believe that the DPRK has an HEU program. In the U.S., there is the widespread view that the complete, verifiable resolution of this HEU issue is now mandatory. This is a practical issue, and there must be a multilateral discussion to resolve it.” In response, Vice Minister Kim Gye Gwan stated that the DPRK had no HEU program. Upon further questioning he stated that the DPRK had chosen the plutonium path to a deterrent. It had no facilities, equipment or scientists dedicated to an HEU program, adding, “We can be very serious when we talk about this. We are fully open to technical talks.”

#### *Concluding Remarks*

Mr. Chairman, I would like to summarize my observations based on our visit to the Yongbyon Nuclear Scientific Research Center and discussions in Pyongyang.

- The 5 MWe reactor has been restarted. It appears to be operating smoothly providing heat and electricity, while also accumulating approximately 6 kg of plutonium per year in its spent fuel rods.
- The 50 MWe reactor construction site appears to have seen no activity since the IAEA inspectors were instructed to leave in 2002. The reactor and the construction site look in a bad state of repair. It would require a major construction program to finish the reactor.
- The spent fuel pond is empty; the approximately 8,000 fuel rods have been moved.
- The DPRK claimed to have reprocessed all 8,000 fuel rods to extract plutonium metal during one continuous campaign between mid-January 2003 and end of June 2003. The 8,000 fuel rods are estimated to contain up to 25 to 30 kg of plutonium metal. We could not definitively substantiate that claim. However, the Radiochemical Laboratory staff demonstrated that they had the requisite facility, equipment and technical expertise, and they appear to have the capacity to do so.
- It is possible that they moved the 8,000 fuel rods to a different storage location. However, such storage would represent a serious health and safety hazard.
- We were shown what was claimed to be a sample of plutonium metal product. I was not able to definitively confirm that what we saw was actually plutonium metal, but all observations I was able to make are consistent with the sample being plutonium metal. However, even if the sample were plutonium metal, I would not have been able to substantiate that it was plutonium from the most recent reprocessing campaign. Such a determination requires more sophisticated measurements.
- In the foreseeable future, the DPRK can produce 6 kg of plutonium per year in its 5 MWe reactor. It easily has the capacity to reprocess the spent fuel at any time to extract the plutonium. It also has the capacity to reload the reactor with fresh fuel for a second and subsequent reloading. It is not, however, in a position to increase the rate of plutonium production much beyond 6 kg per year without a major construction project at the 50 MWe or 200 MWe reactor sites, something that would be difficult to do clandestinely.
- Officials of the DPRK Ministry of Foreign Affairs claimed that the DPRK had weapons of mass destruction. They believe that they provided us with evidence of their “deterrent.” At Yongbyon, they demonstrated that they most likely had the capability to make plutonium metal. However, I saw nothing and spoke to no one who could convince me that they could build a nuclear device with that metal and that they could weaponize such a device into a delivery vehicle. We were not able to arrange meetings with DPRK staff who may have such expertise or visit related facilities.

- Officials of the DPRK Ministry of Foreign Affairs also stated categorically that the DPRK has no program for enriching uranium. Moreover, they claim to have no equipment and no scientific expertise to do so. We were not able to substantiate these claims.

Let me close by stating that I shared these conclusions with our DPRK hosts before my departure. I told them that my observations still have uncertainties. I may be able to reduce some of the uncertainties through discussions with other U.S. specialists, with additional analysis, and through peer review. I intend to do so and write a more comprehensive technical report in the future. The response of the DPRK officials was quite positive although they had hoped that my conclusions would be more definitive. They asked me to report my observations as I presented them.

Finally, Mr. Chairman, I found the trip to be remarkable. Our DPRK hosts were most courteous and cooperative. I would like to acknowledge the Albright/O'Neil book, *Solving The North Korean Nuclear Puzzle*, the Report from the Department of State/Department of Energy Spent Fuel Canning Team, and discussions with several of my colleagues at Los Alamos, all of which helped me to prepare for this visit. I hope that our findings will contribute at least in some small way to a resolution of the current nuclear crisis and the eventual denuclearization of the Korean Peninsula. Thank you for giving me the opportunity to share our findings with you.

NOTE:

<sup>1</sup>David Albright, Kevin O'Neill, editors. "Solving the North Korean Nuclear Puzzle," ISIS Reports, The Institute for Science and International Security, Washington, D.C., 2000.